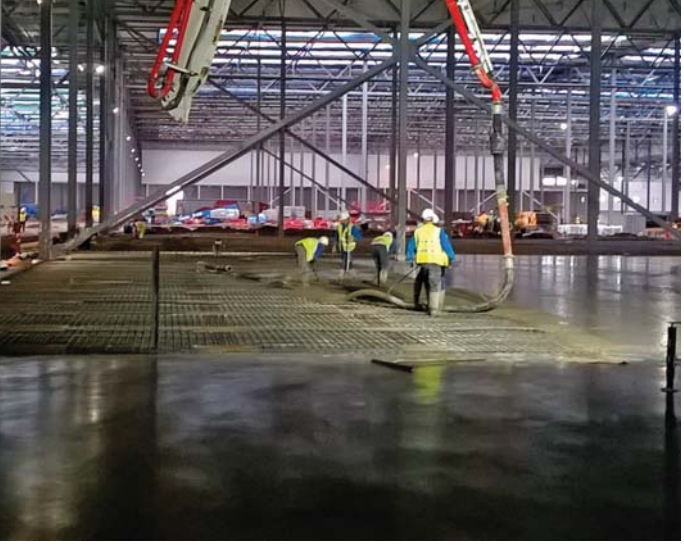

Figure 1: Concrete pour at the Avonmouth RDC.

Figure 2: Aerial view of the RDC site in Avonmouth.

Software-designed flooring

__Twintec Projects__ recently completed pile-supported floor slabs for a new regional distribution centre (RDC) at Avonmouth for one of Europe's leading food retailers to service the supermarket's expanding operations in south-west England. __Colin Shephard__ reports.

This major food retailer operates its RDCs as multi-channel, multi-product centres rather than having separate facilities for different product lines. This means that within each RDC there is provision for ambient, chilled and frozen food product plus storage for the wider non-food product ranges that it retails. This multi-channel approach means that there are different zones within the RDC that have different loading criteria and internal temperatures to consider.

Having previously completed the floor slabs for another RDC for this retailer, Twintec was well aware of the impact of the different load cases and temperature zones and worked closely with the client design team to develop a technical solution.

As the ground support value in the area was poor, a piled solution was required and, in line with its company policy, the client would not accept a solution using steel fibres. Normally, this would have been a problem but an alternative was offered via a competitive, traditionally reinforced solution and which met all the criteria.

This solution was designed using DIANA FEA finite-element software, which accurately models the behaviour of reinforced concrete structures including the consideration of the performance of the specific concrete and the effect of ambient temperatures at the time of casting.

Ideal floor?

The Concrete Society publication, Technical Report 34[1], is viewed as the 'Bible' for concrete floor slab design and construction in the UK. Within TR34 (Third Edition[2]) is the statement, "an ideal floor would be perfectly flat and have no joints" – but can this be achieved?

Recent developments in concrete slab design mean that we are getting closer to achieving the second part of this ideal – truly jointless construction. This has led to the development of the Twintec ULTIMAT product – a slab using DIANA FEA design methodology and hybrid reinforcement to provide areas in excess of 60,000m^2 without any opening joints. The technology allows the end user to install any combination of racking or conveyor installation without any constraints to placement of supports – providing flexibility throughout the life of the building and significantly reducing maintenance requirements.

Normally, this solution is based on a minimum crack width and no opening joints but, because of its concerns over temperature effects, the client insisted on having armoured movement joints in the slabs. This introduced additional stresses that then had to be modelled within the design and resulted in extra steel reinforcement being required. The final designs involved the placing and fixing of multiple layers of fabric reinforcement and additional loose bar over pile positions and adjacent to joints. In some cases this meant that over 45 tonnes of steel was required per pour panel – all of which was placed and fixed by the on-site team in less than 24 hours.

In total, 54,500m^2 of slab was laid, containing around 1650 tonnes of steel reinforcement, in a period of just ten weeks on-site. The slabs varied in thickness from 230 to 250mm, depending on the loads carried and the pile spacing, and the majority of areas included underfloor heating pipes zoned to suit the client's requirements.

To reduce wheel impact damage and provide a smooth transition in areas of greatest use by material-handling equipment, Twintec and the client team defined specific locations where a sinus-wave profile joint was used in lieu of standard steel armoured construction joints. The sinus profile at the joint crossing effectively reduced impact damage at the opening to zero.

The innovative design approach has provided the client with a tailor-made solution meeting and exceeding its needs. ■

References:

1. CONCRETE SOCIETY. *Concrete industrial ground floors – a guide to design and construction.* Technical Report 34, Fourth Edition, Camberley, third impression March 2016.
2. CONCRETE SOCIETY. *Concrete industrial ground floors – a guide to design and construction.* Technical Report 34, Third Edition, Camberley, 2003.